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Two-photon Cyclotron Absorption in the Microwave-Induced Zero States JIE ZHANG, RUIRUI DU, Rice Univ, LORREN PFEIFFER, KEN WEST, Prinston Univ — Utilizing a microwave reflection spectroscopy we simultaneously measure cyclotron absorption and electrical transport in zero-resistance state. Two-photon processes are observed in the cyclotron absorption and transport measurement with different power dependence and plasmon coupling. Surprisingly, two-photon cyclotron transitions account for the major absorption peak regardless of microwave power. We attribute the far-fields peaks in the photoresistance spectra to a multiphoton inelastic mechanism, which relaxes mainly by impurity scattering. We interpret the observation as that the two-photon cyclotron absorption arises from stepwise single photon transitions and relaxes mainly through phonon coupling. These two distinct mechanisms coexist in the same cyclotron resonance process. Work at Rice were founded by NSF DMR-1508644 and Welch grant C-1682.

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